

UPlan: How It Works



An introduction to UPlan for the California Water Plan

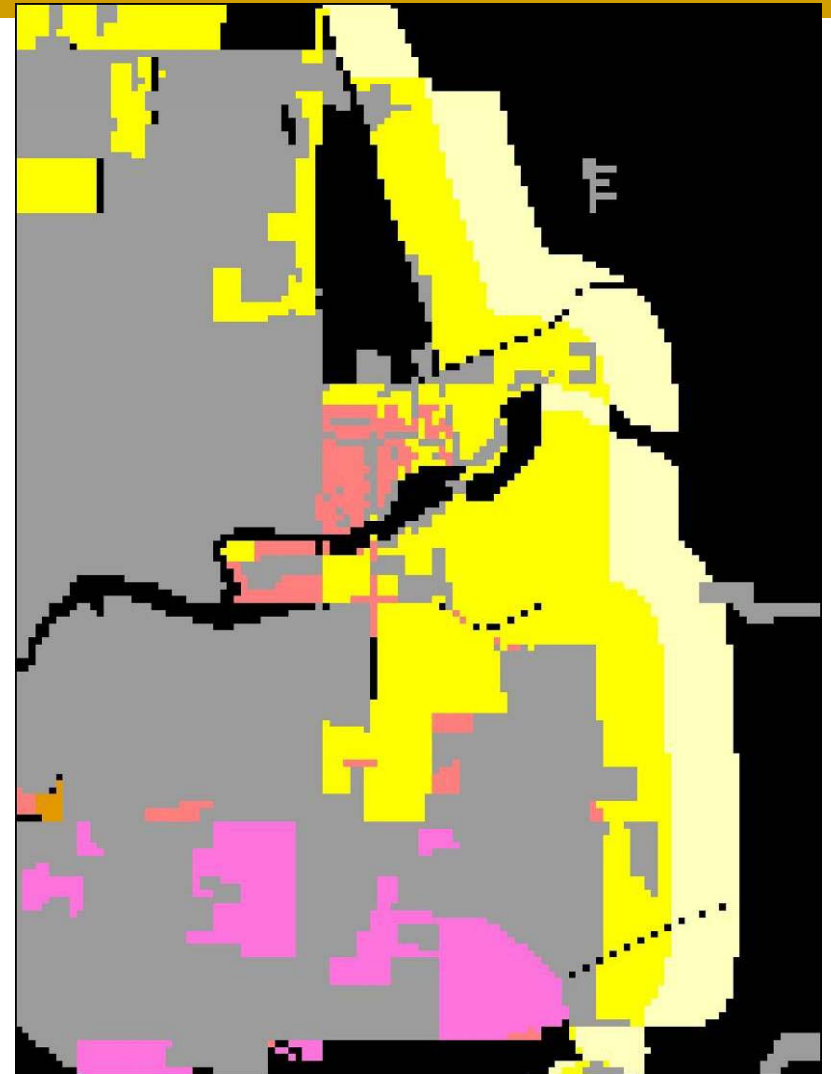
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Why do we model?

- ✎ 1. Models allow us to test a wide variety of policy, planning and investment alternatives
- ✎ 2. Models create a consistent set of rules and criteria to test the alternatives.
- ✎ 3. Models allow us to respond to a wide variety of statutes requiring more accurate forecasts than in the past.

What do we get from our models?

- ∞ Spatial Output
 - Where is the growth?
- ∞ Tabular Output
 - How much?
- ∞ Analysis
 - What are the likely impacts?
- ∞ Inputs to Other Models



UPlan

∞ Simple

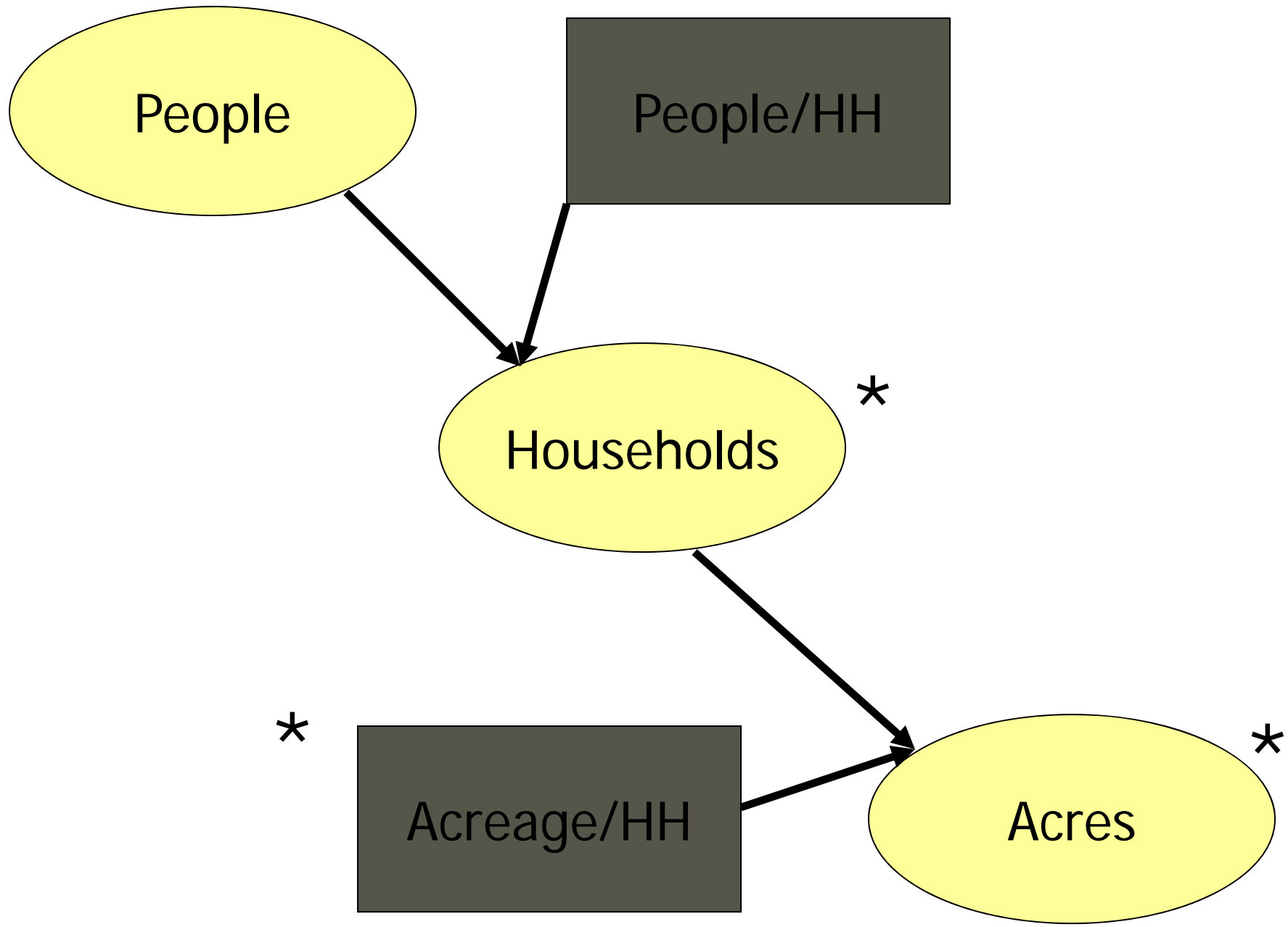
- Relatively simple data
- Generally accessible demographic inputs
- Simple algorithm/rules

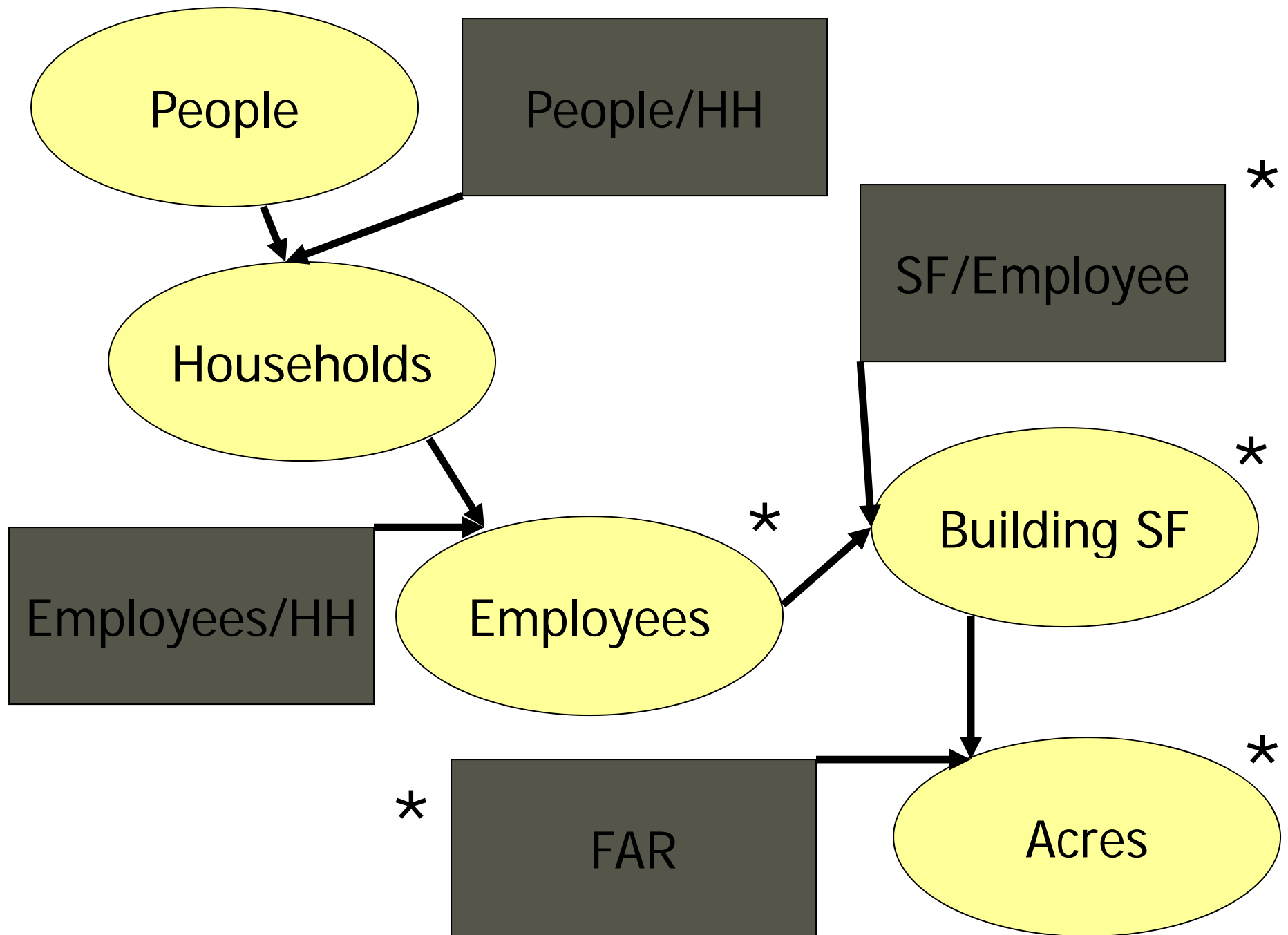
∞ Rule based

- The “rules” govern the system

∞ Urban Growth

- A simple inexpensive model with rapid run times and fast data development





Combine Attractors

Urban Edge

4	4	4	4
4	4	4	4

Amenity

	3		
		3	3

Major Arterial

	4		
	4		
	4		
	4		

Growth Plans

4			
4	4		
4	4	2	2
2	2	2	2

Combined Effect

=

8	11	4	4
8	12	7	7
4	8	2	2
2	6	2	2

Allocation

General Plan

R	R	R	R
R	R	C	C
R	C	C	C
R	R	I	I

Net Attraction

8	11	4	4
8	12	7	7
4	8	2	2
2	6	2	2

We need 5 Residential, 3 Commercial, 2 Industrial

R	R		
R	R	C	C
	C		
	R	I	I

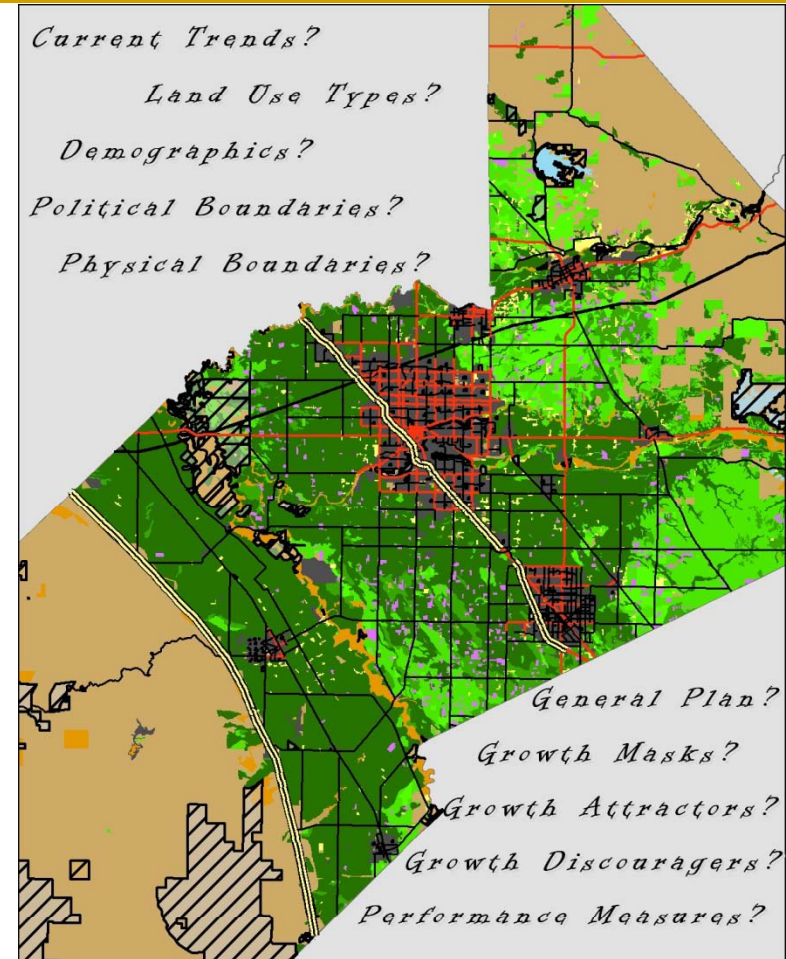
5 Highest Residential Attractions
 3 Highest Commercial Attractions
 2 All Industrial Selected

Some Technical Terms

- ∞ Land Use: a type of developed land purpose used within UPlan. Either Residential or Employment
- ∞ Buffer Class: A set of attractors and discouragers that apply to one or more Land Uses
- ∞ Variant: A collection of buffer classes and land uses intended to work together

Data Types

- ∞ Land Uses
- ∞ Demographics
 - Residential
 - Employment
- ∞ “General Plans”
- ∞ Masks
- ∞ Attractors
- ∞ Discouragers



Land Uses

UPlan 2.6x

- ✧ Customizable
 - Local Preference
 - Integration with other models
- ✧ Aggregate
 - Groupings of Similar Uses
- ✧ Developed Land Use Types
 - Not Agriculture or Timber

Two “Types” of Land Use

- ✧ Residential Types
 - Density Classes
- ✧ Employment Types
 - Square Feet per Employee
 - Floor Area Ratio

Suggested Land Uses

☞ Industrial

- Heavy Industrial
- Light Industrial

☞ Commercial Multi-Story

- Commercial High-Office
- Commercial High-Government

☞ Commercial 1-2 Story

- Commercial Low-Office
- Commercial Low-Government
- Commercial Low-Retail

☞ Multi-Family Multi-story

- Residential High >12du/ac

☞ Multi-Family Single Entrance or Dense SFD

- Residential Medium 8-12du/ac

☞ Single Family

- Residential Low-Upper 5-8du/ac
- Residential Low-Medium 2-5du/ac
- Residential Low-Lower 2-0.5du/ac

☞ Rural Residential

- Rural Residential-Upper 2-5ac/du
- Rural Residential-Lower 5-20ac/du

☞ Large Lot Rural

- Rural Estates-Attraction 20+ac/du
- Rural Estates-Non-Attraction 20+ac/du

Residential Demographics

Population Growth

- Starting population
- Ending population
- Adjusted to account for infill or redevelopment

Average Household Size (PPHH)

- Alternately average persons per housing unit (PPHU)

Housing Proportions by Density Class

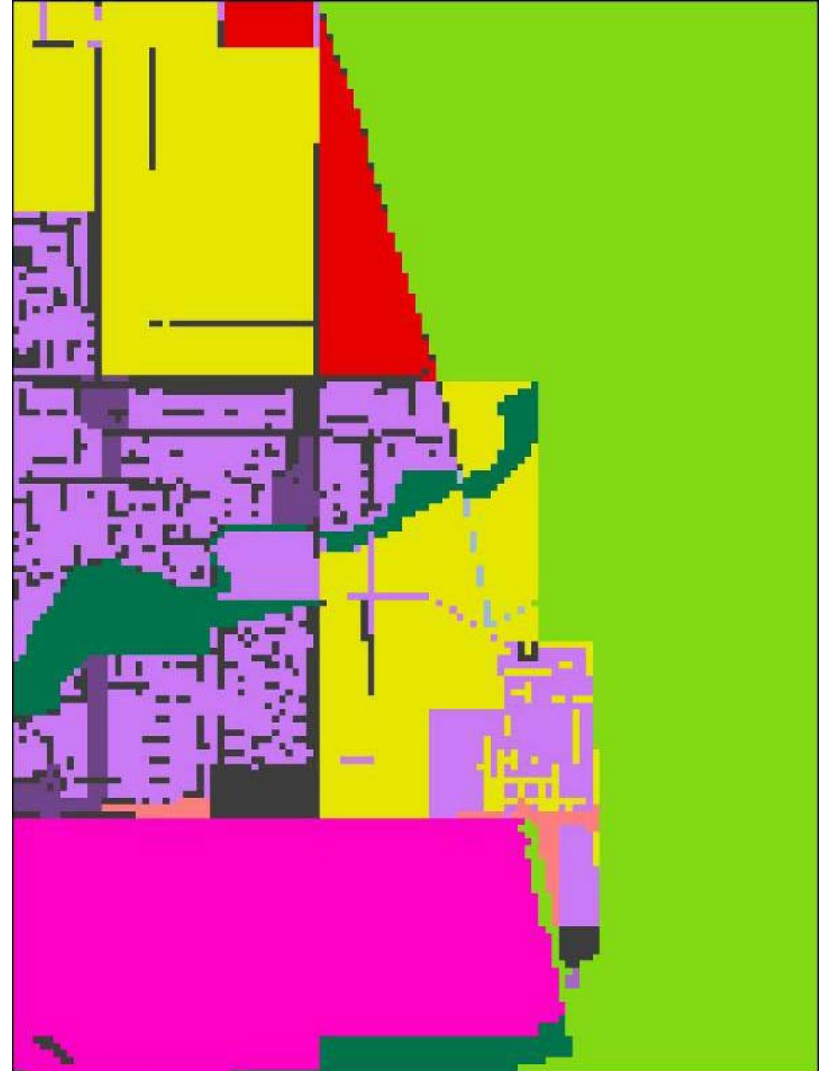
- Percentage of new units entering each residential type
- Average gross “footprint” per household

Employment Demographics

- ⌘ Average number of employed people per household
- ⌘ Percentage of employees entering each employment type
- ⌘ Average square footage per employee in buildings for each employment type
- ⌘ Floor Area Ratio for each employment type

“General Plans”

- ☞ Adopted General Plans
 - Test existing general plans
- ☞ Speculative General Plans
 - What if?...
- ☞ Provide the Structure for the Region's Development
 - Guide development to appropriate general locations

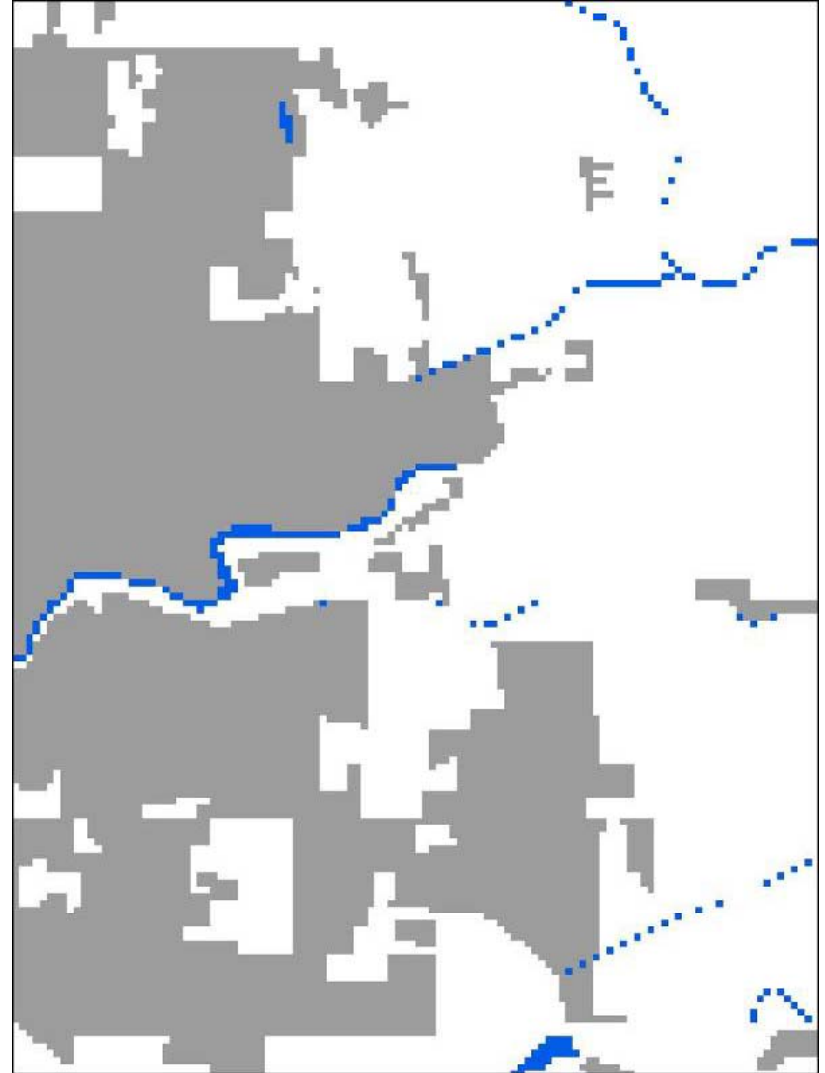


Masks

∞ Prevent any growth at all.....

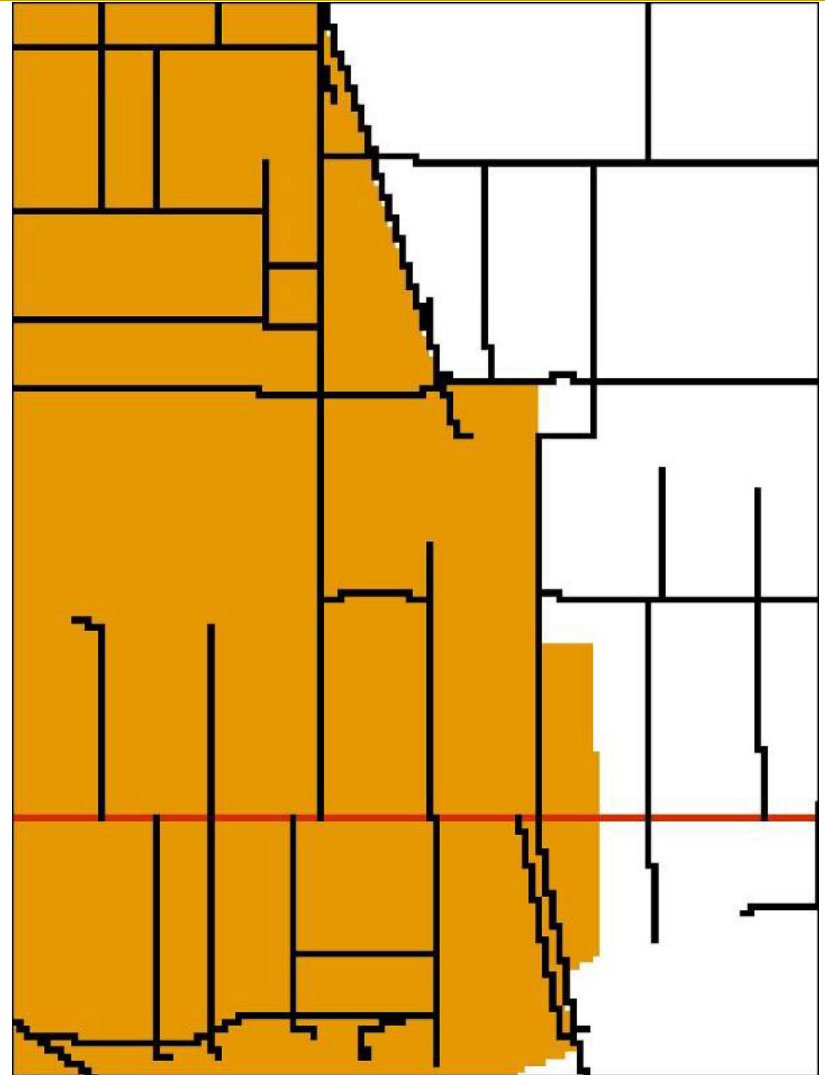
∞ Examples

- Water Bodies
- Public Land
- Existing Development (no redevelopment)
- Slopes/Geology



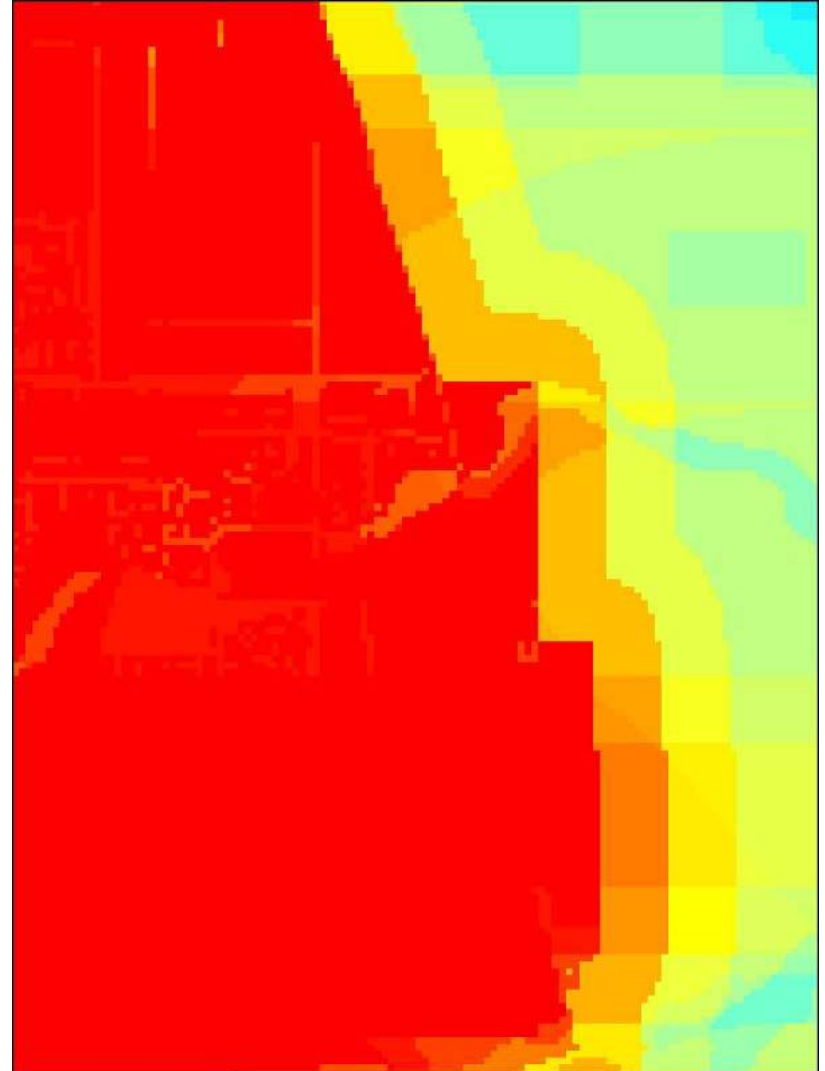
Attractors

- ⌘ Features that encourage development
- ⌘ Fancy Terms
 - Pseudoeconomic
 - Hedonic
- ⌘ The Data Represents
 - Effects of Policy
 - Physical Features
- ⌘ Types of Attractors
 - Transportation Infrastructure
 - Urban Services
 - Water, wastewater
 - Police, fire..
 - Amenities
 - Regulatory Boundaries



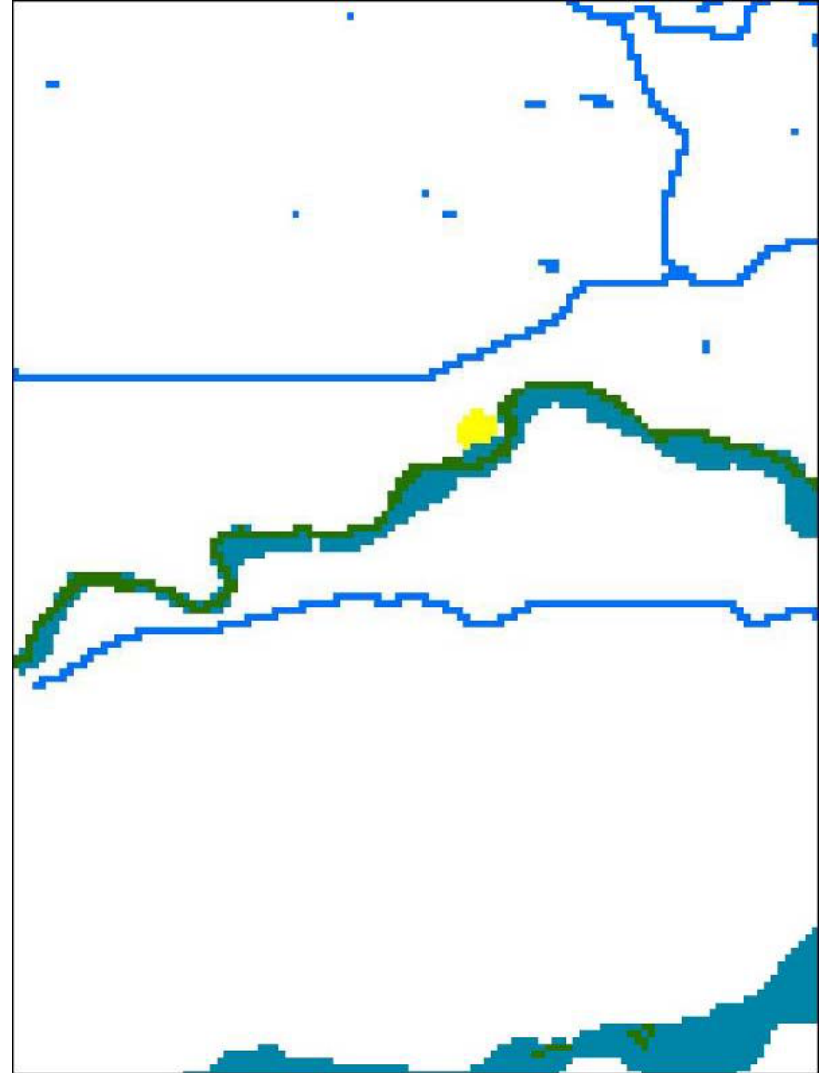
Attractors

- ⌘ Roads and transportation infrastructure
- ⌘ Urban services:
 - Water and wastewater
 - Safety... police, fire
 - Transit
 - Amenities.... parks, entertainment, cultural events
- ⌘ Past or Planned Growth
- ⌘ Regulatory boundaries
 - City Limits
 - Spheres of Influence



Discouragers

- ✧ Features that discourage development
- ✧ Represent
 - Policy effects
 - Physical features
- ✧ Types of discouragers
 - Physical (slopes, floodplains)
 - Environmental (habitat, hazards, agriculture)
 - Administrative
 - Infrastructure Limitations



Discouragers

☞ Physical

- Steep or unstable slopes
- Floodplains

☞ Environmental

- Natural resource protections... wetlands, species, agriculture, mineral resources
- Hazards... Mining, soils

☞ Administrative

- Fees and exactions

☞ Infrastructure Limits

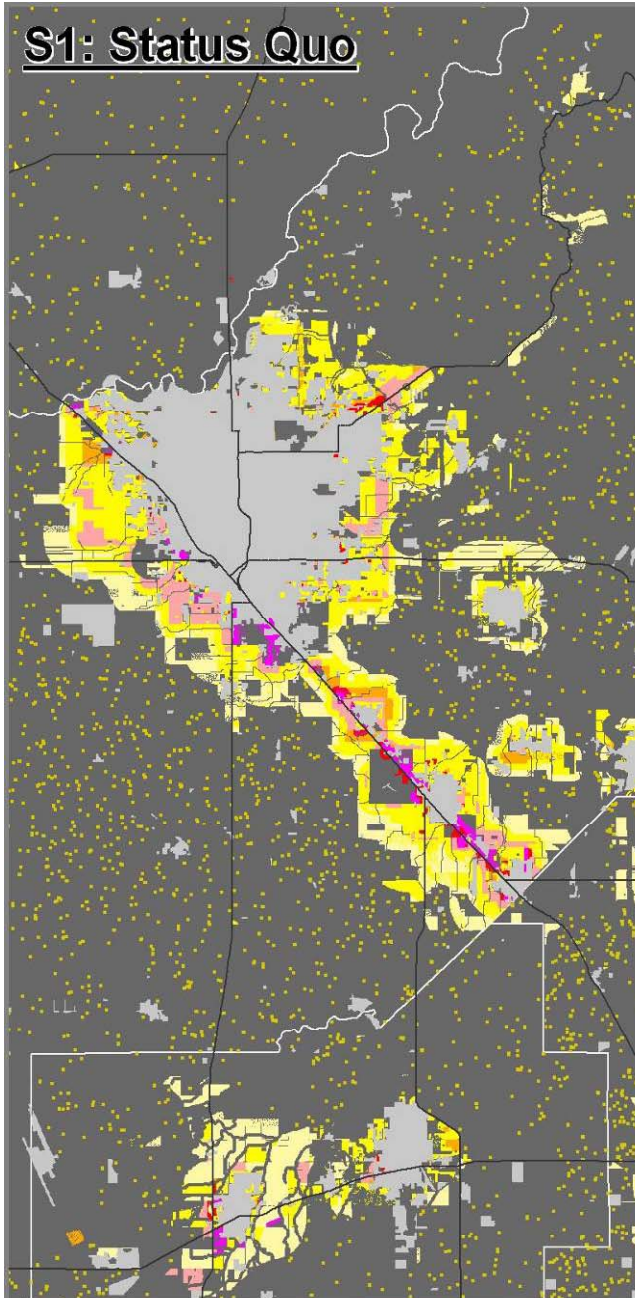
- Transportation
- Water

What can be done with Uplan?

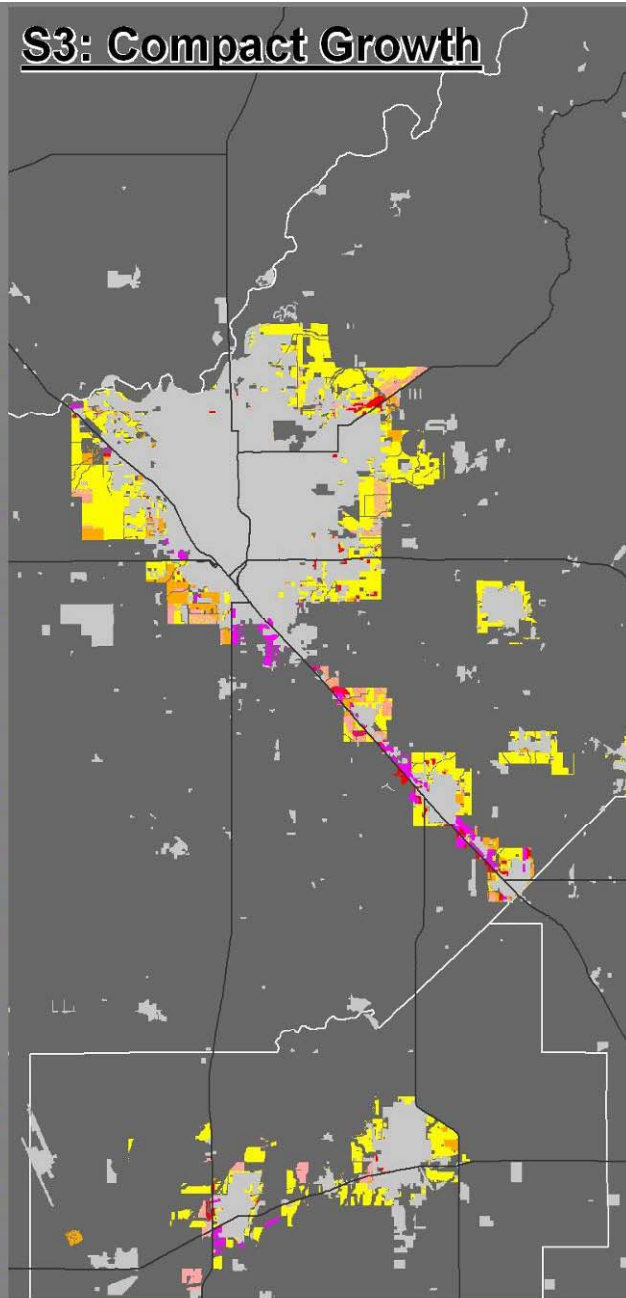
∞ Types of Scenarios

- Recent trends (aka Status Quo, Base Case, Business as Usual)
- General Plan Buildout
- Change Scenarios
 - Sprawl
 - Compact
 - Resource protection
 - New Cities
 - Resource limitations

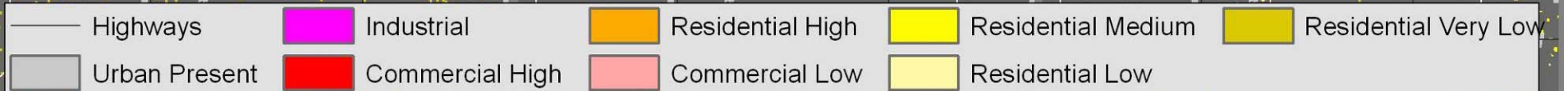
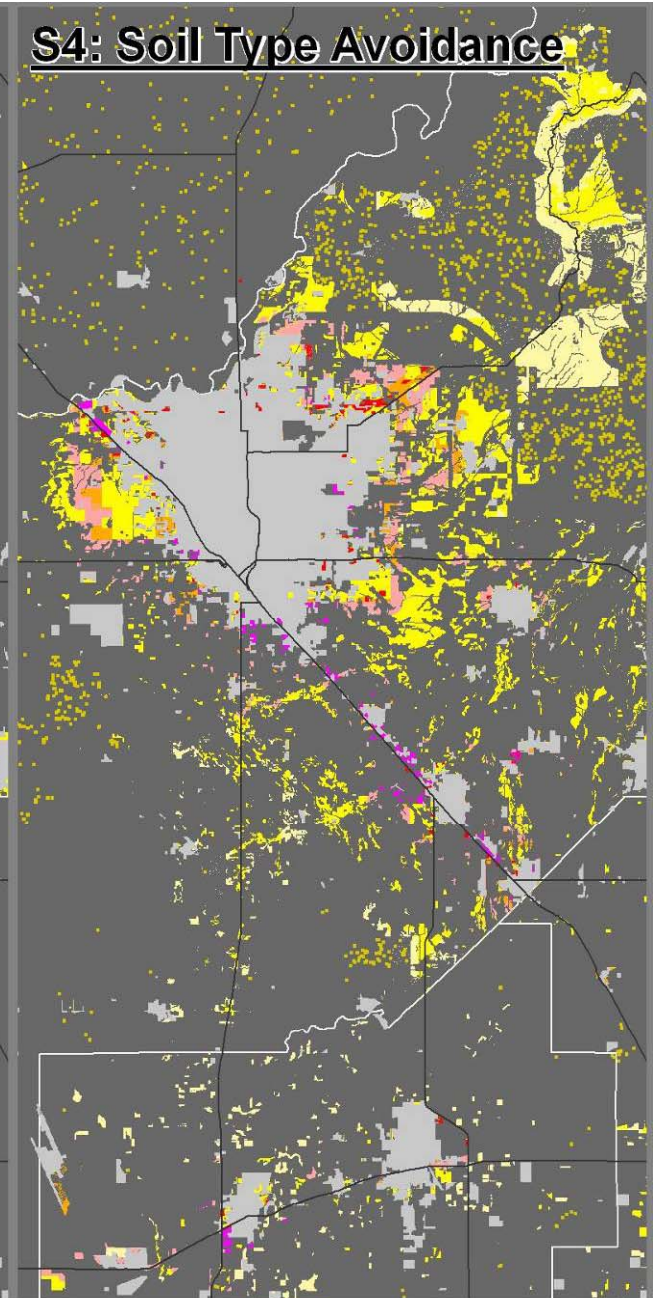
S1: Status Quo



S3: Compact Growth



S4: Soil Type Avoidance



Analysis/Performance Measures

- ✧ Urban Footprint Growth
 - Agriculture or other land conversion
- ✧ Transportation
 - Export to Transportation Modeling
- ✧ Air Quality
 - Based on Transportation Modeling output
- ✧ Greenhouse Gasses
 - Building type, location, service provider
- ✧ Resource Consumption
 - Discouragement impacts
 - Other summarization
- ✧ Population Distribution
- ✧ Accessibility/Economic Activity
 - Using accessibility/travel times to core areas

Reports

∞ Generated in MS Excel

∞ Metadata

∞ Land Consumption

- Demand: Acres and Cells
- Allocated: Acres and Cells
- Underallocation: Acres and Cells

∞ Discouragement Impacts

- Acres of each discouragement consumed by land use type

Reports

Microsoft Excel - report.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

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	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Results												
2													
3	Model Run Allocation Area: Demand					Model Run Allocation Area: Actual					Under Allocatic Under Allocation		
4		Land Use		Cells	Acres		Land Use		Cells	Acres		Cells	Acres
5		Industrial		5,613	3,467		Industrial		5,613	3,468		0	-1
6		Commercial High		1,672	1,033		Commercial High		1,672	1,033		0	0
7		Residential High		932	576		Residential High		932	576		0	0
8		Commercial Low		15,465	9,554		Commercial Low		15,465	9,554		0	0
9		Residential Medium		110,110	68,022		Residential Medium		110,110	68,022		0	0
10		Residential Low		17,478	10,797		Residential Low		17,478	10,797		0	0
11		Residential Very Low		29,130	17,995		Residential Very Low		29,134	17,998		-4	-3
12													
13													
14													

General Info Results Results by TAZ Discouragement Impact Demographic Inputs Residential Inj

Ready NUM

	A	B	C	D
1	Discouragement Impact			
2				
3	Discouragement Layer	Land Use	Acres	
4	88	Industrial	0	
5	88	Commercial Hig	0	
6	88	Residential High	0	
7	88	Commercial Low	0	
8	88	Residential Med	0	
9	88	Residential Low	0	
10	88	Residential Very	61	
11	esc_soi_g	Industrial	0	
12	esc_soi_g	Commercial Hig	0	
13	esc_soi_g	Residential High	5	
14	esc_soi_g	Commercial Low	0	
15	esc_soi_g	Residential Med	541	
16	esc_soi_g	Residential Low	0	
17	esc_soi_g	Residential Very	0	
18				
19				
20				
21				
22				

General Info Results Result

Ready NUM

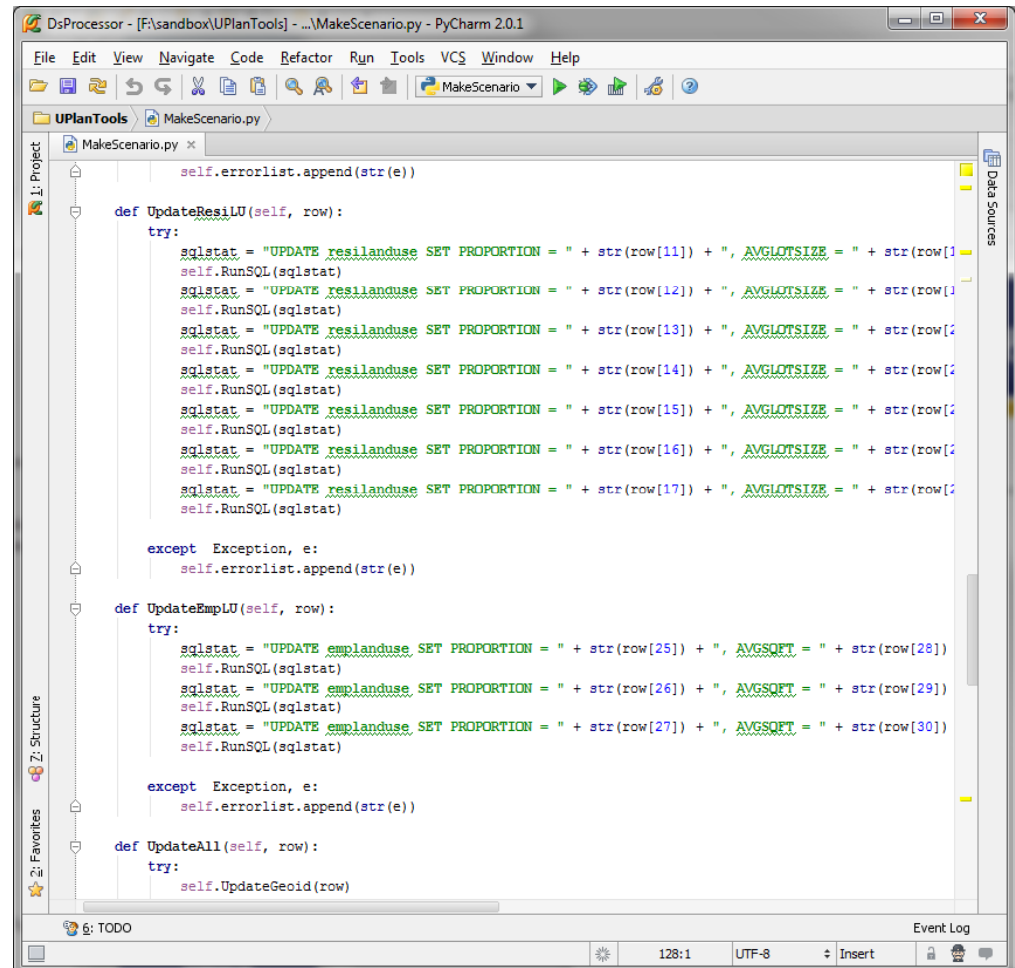
	A	B
1	Demographic Inputs	
2		
3	Base Population	668,265
4	Future Population	1,783,973
5	Persons per Household	3.1
6	Employees per Household	0.99
7	Base Employment	0
8	Future Employment	0
9	Vacant Inner Percentage	0
10	Vacant Outer Percentage	0
11	Residential Redevelopment Population	N/A
12		
13		

General Info Results Result

Ready NUM

Other Tools

- ✧ Batch Model Runs
- ✧ Scenario “Broadcasting”
 - Python based
 - Creates and distributes settings
 - Setup batch runs
- ✧ Other Scripting
 - Results compilation
- ✧ Zonal Summaries
- ✧ Export to Other Models



```
self.errorlist.append(str(e))

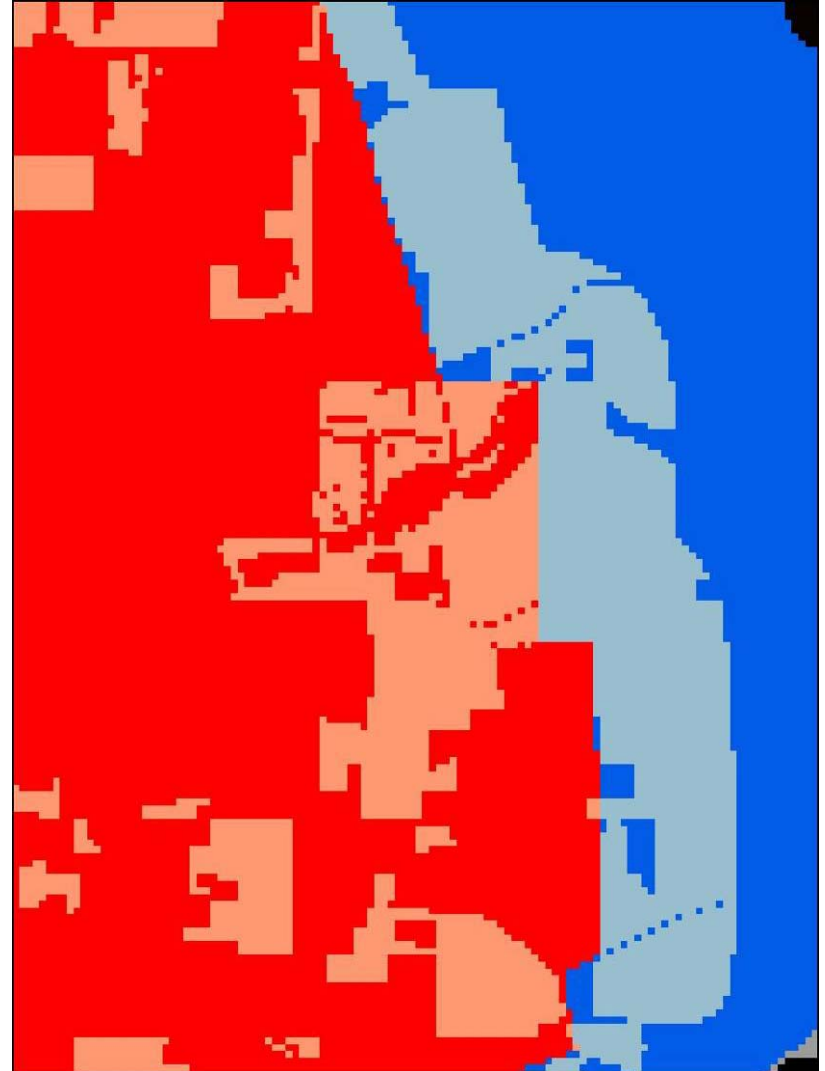
def UpdateResilLU(self, row):
    try:
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[11]) + ", AVGLOTSIZE = " + str(row[12])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[12]) + ", AVGLOTSIZE = " + str(row[13])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[13]) + ", AVGLOTSIZE = " + str(row[14])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[14]) + ", AVGLOTSIZE = " + str(row[15])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[15]) + ", AVGLOTSIZE = " + str(row[16])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[16]) + ", AVGLOTSIZE = " + str(row[17])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE resilanduse SET PROPORTION = " + str(row[17]) + ", AVGLOTSIZE = " + str(row[18])
        self.RunSQL(sqlstat)
    except Exception, e:
        self.errorlist.append(str(e))

def UpdateEmplLU(self, row):
    try:
        sqlstat = "UPDATE emplanduse SET PROPORTION = " + str(row[25]) + ", AVGSQFT = " + str(row[28])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE emplanduse SET PROPORTION = " + str(row[26]) + ", AVGSQFT = " + str(row[29])
        self.RunSQL(sqlstat)
        sqlstat = "UPDATE emplanduse SET PROPORTION = " + str(row[27]) + ", AVGSQFT = " + str(row[30])
        self.RunSQL(sqlstat)
    except Exception, e:
        self.errorlist.append(str(e))

def UpdateAll(self, row):
    try:
        self.UpdateGeoid(row)
```

Zonal Summary

- ⌘ How much development is happening where?
- ⌘ New population centers
- ⌘ New Employment centers



Zonal Summaries

Calculate by Zone:

- # Acres of each land use
- # of HH in each residential type
- # of residents in each residential type
- # of employees in each employment type
- # of square feet in building space for each employment type

Microsoft Excel - sjq_sub.dbf

Type a question for help

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sjq_sub

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	sjq_subbnd	in_Acres	in_Emp	in_SqFt	ch_Acres	ch_Emp	ch_SqFt	rh_Acres	rh_HH	rh_Pop	cl_Acres	cl_Emp	cl_SqFt	rm_Acres	rm_HH
2	1	0	0	0	0	0	0	5	62	192	0	0	0	2169	10845
3	2	0	0	0	0	0	0	0	0	0	0	0	0	457	2286
4	3	0	0	0	0	0	0	0	0	0	0	0	0	618	3089
5	4	206	4134	2067000	0	0	0	23	286	887	1786	38898	11669400	16397	81986
6	5	1097	21984	10992000	95	7205	1441000	55	687	2130	2890	62942	18882600	10747	53733
7	6	75	1498	749000	46	3485	697000	419	5243	16253	432	9418	2825400	5072	25359
8	7	1203	24113	12056500	351	26748	5349600	54	680	2108	2814	61287	18386100	11212	56062
9	8	0	0	0	6	471	94200	4	46	143	183	3983	1194900	1862	9310
10	9	886	17751	8875500	536	40829	8165800	15	193	598	1449	31552	9465600	19487	97437

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Greenhouse Gas

Microsoft Excel - sjq_demo3.dbf

Type a question for help

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	SP	CZ	LU	Acres	HH	EMP	SF	EDemand	GDemand	NGEDemand	ColEDemand	NG_CO2E	Coal_CO2E	Thrm_CO2E	CO2E	Tons_CO2E
1	37	2	7	12950	1295	0	3,237,500	14,018,375	906,500	5,887,718	420,551	529,894,620	76,119,731	40,792,500	646,806,851	647
2	37	2	6	9826	9826	0	24,565,000	106,366,450	6,878,200	44,673,909	3,190,994	4,020,651,810	577,569,914	309,519,000	4,907,740,724	4,908
3	37	2	5	60212	301061	0	662,334,200	2,867,907,086	185,453,576	1,204,520,976	86,037,213	108,406,887,840	15,572,735,553	8,345,410,920	132,325,034,313	132,325
4	22	2	5	436	2178	0	4,791,600	20,747,628	1,341,648	5,186,907	1,867,287	466,821,630	337,978,947	60,374,160	865,174,737	865
5	37	2	4	9110	0	198419	59,525,776	770,858,799	17,262,475	323,760,696	23,125,764	29,138,462,640	4,185,763,284	776,811,377	34,101,037,301	34,101
6	37	2	1	3165	0	63427	31,713,713	601,308,891	20,502,778	252,549,734	18,039,267	22,729,476,060	3,265,107,327	922,624,999	26,917,208,386	26,917
7	22	2	4	120	0	2624	787,111	10,193,087	228,262	2,548,272	917,378	229,344,480	166,045,418	10,271,799	405,661,697	406
8	22	2	1	204	0	4097	2,048,642	38,840,912	1,324,355	9,710,228	3,495,682	873,920,520	632,718,442	59,595,986	1,566,234,948	1,566
9	22	2	6	31	31	0	77,500	335,575	21,700	83,894	30,202	7,550,460	5,466,562	976,500	13,993,522	14
10	22	2	7	14	1	0	2,500	10,825	700	2,706	974	243,540	176,294	31,500	451,334	0
11	37	2	3	206	2571	0	3,085,200	13,358,916	863,856	5,610,745	400,767	504,967,050	72,538,827	38,873,520	616,379,397	616
12	37	2	2	981	0	74782	14,956,455	193,686,092	4,337,372	81,348,159	5,810,583	7,321,334,310	1,051,715,523	195,181,738	8,568,231,571	8,568
13	27	2	7	5034	503	0	1,257,500	5,444,975	352,100	816,746	381,148	73,507,140	68,987,788	15,844,500	158,339,428	158
14	41	2	1	23	0	470	235,192	4,455,755	151,928	445,576	267,345	40,101,840	48,389,445	6,836,738	95,328,023	95
15	41	2	4	36	0	794	238,152	3,084,068	69,064	308,407	185,044	27,756,630	33,492,964	3,107,884	64,357,478	64
16	27	2	6	888	888	0	2,220,000	9,612,600	621,600	1,441,890	672,882	129,770,100	121,791,642	27,972,000	279,533,742	280
17	27	2	5	6673	33365	0	73,403,000	317,834,990	20,552,840	47,675,248	22,248,449	4,290,772,320	4,026,969,269	924,877,800	9,242,619,389	9,243
18	27	2	3	370	4626	0	5,551,200	24,036,696	1,554,336	3,605,504	1,682,569	324,495,360	304,544,989	69,945,120	698,985,469	699
19	26	2	5	693	3466	0	7,625,200	33,017,116	2,135,056	6,603,423	2,641,369	594,308,070	478,087,789	96,077,520	1,168,473,379	1,168
20	26	2	6	53	53	0	132,500	573,725	37,100	114,745	45,898	10,327,050	8,307,538	1,669,500	20,304,088	20
21	26	2	2	6	0	471	94,184	1,219,683	27,313	243,937	97,575	21,954,330	17,661,075	1,229,101	40,844,506	41
22	27	2	4	287	0	6243	1,872,921	24,254,327	543,147	3,638,149	1,697,803	327,433,410	307,302,343	24,441,619	659,177,372	659
23	27	2	2	46	0	3485	696,963	9,025,671	202,119	1,353,851	631,797	121,846,590	114,355,257	9,095,367	245,297,214	245
24	27	2	1	74	0	1485	742,710	14,078,290	480,026	2,111,744	985,480	190,056,960	178,371,880	21,601,181	390,030,021	390

Ready

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Acknowledgements

California Department of Transportation
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Federal Highway Administration



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Questions?

